# Asterix expansion 048 - Monoradar Target Reports Appendix A: Reserved Expansion Field

**category**: 048

**edition**: 1.13

**date**: 2024-12-01

**FSPEC byte size**: 1

## Items

### MD5 - Mode 5 Reports

definition: Mode 5 Data/Reports, Extended Mode 1 Code and X pulse.

Compound

**MD5/SUM - Mode 5 Summary**

Group

**MD5/SUM/M5**

Element
bit size: 1
Values:

- **0:** No Mode 5 interrogation
- **1:** Mode 5 interrogation

**MD5/SUM/ID**

Element
bit size: 1
Values:

- **0:** No authenticated Mode 5 ID reply/report
- **1:** Authenticated Mode 5 ID reply/report

**MD5/SUM/DA**

Element
bit size: 1
Values:

- **0:** No authenticated Mode 5 Data reply/report
- **1:** Authenticated Mode 5 Data reply/report (i.e any valid Mode 5 reply type other than ID)

**MD5/SUM/M1**

Element
bit size: 1
Values:

- **0:** Mode 1 code not present or not from Mode 5 reply/report
- **1:** Mode 1 code from Mode 5 reply/report

**MD5/SUM/M2**

Element
bit size: 1
Values:

- **0:** Mode 2 code not present or not from Mode 5 reply/report
- **1:** Mode 2 code from Mode 5 reply/report

**MD5/SUM/M3**

Element
bit size: 1
Values:

**0:** Mode 3 code not present or not from Mode 5 reply/report
**1:** Mode 3 code from Mode 5 reply/report

**MD5/SUM/MC**

Element
bit size: 1
Values:

**0:** Mode C altitude not present or not from Mode 5 reply/report
**1:** Mode C altitude from Mode 5 reply/report

Spare bits: 1

**Notes:**

1. The flags M2, M3, MC refer to the contents of data items I048/050, I048/070 and I048/090 respectively. The flag M1 refers to the contents of data item I048/055, Mode 1 Code in Octal Representation, and to the contents of the Subitem #5 (Extended Mode 1 Code in Octal Representation).
2. If an authenticated Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I048/020, Target Report Descriptor, shall be set.
3. If an authenticated Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I048/020, Target Report Descriptor, shall be set.

**MD5/PMN - PIN/ National Origin/Mission Code**

Group

Spare bits: 2

**MD5/PMN/PIN - PIN Code**

Element
bit size: 14
Raw Content

Spare bits: 2

**MD5/PMN/NAV - Validity of NAT**

Element
bit size: 1
Values:

**0:** National Origin is valid
**1:** National Origin is invalid

**MD5/PMN/NAT - National Origin**

Element
bit size: 5
Raw Content

Spare bits: 2

**MD5/PMN/MIS - Mission Code**

Element
bit size: 6
Raw Content

**Note:** Bit 14 (NAV) is set to 1 if the value for National Origin is not known or invalid. Under certain conditions PIN is available but NAT is not available. NAV then indicates that the NAT field was not actively populated.

**MD5/POS - Mode 5 Reported Position**

Group

**MD5/POS/LAT - Latitude in WGS 84**

Element
bit size: 24
Signed quantity
LSB = $180/2^{2}3$ ° ≈ $2.1457672119140625e-5$ °
unit: ”°”
>= $-90.0$
<= $90.0$

**MD5/POS/LON - Longitude in WGS 84**

Element
bit size: 24
Signed quantity
LSB = $180/2^{2}3$ ° ≈ $2.1457672119140625e-5$ °
unit: ”°”
>= $-180.0$
<= $180.0$

**Notes:** Latitude in WGS 84 is expressed as a 24-bit two’s complement number. Range -90° ≤ latitude ≤ 90°. Sign convention: North is positive. LSB = 180/223 degrees = 2.145767*10-05 degrees. Longitude in WGS 84 is expressed as a 24-bit two’s complement number. Range -180° ≤ longitude < 180°. Sign convention: East is positive. LSB = 180/223 degrees = 2.145767*10-05 degrees. The resolution implied by the LSB is better than the resolution with which Mode 5 position reports are transmitted from aircraft transponders using currently defined formats.

**MD5/GA - Mode 5 GNSS-derived Altitude**

Group

Spare bits: 1

**MD5/GA/RES**

description: ”Resolution with which the GNSS-derived Altitude (GA) is reported”

Element
bit size: 1
Values:

**0:** GA reported in 100 ft increments
**1:** GA reported in 25 ft increments

**MD5/GA/GA**

description: ”GNSS-derived Altitude of target, expressed as height above WGS 84 ellipsoid”

Element
bit size: 14
Signed quantity
LSB = 25 ft ≈ 25.0 ft
unit: ”ft”
>= $-1000.0$

**MD5/EM1 - Extended Mode 1 Code in Octal Representation**

Group

**MD5/EM1/V**

Element
bit size: 1
Values:

**0:** Code not validated
**1:** Code validated

**MD5/EM1/G**

Element
bit size: 1
Values:

**0:** Default
**1:** Garbled code

**MD5/EM1/L**

Element
bit size: 1
Values:

**0:** Mode 1 Code derived from the reply of the transponder
**1:** Mode 1 Code not extracted during the last scan

Spare bits: 1

**MD5/EM1/EM1 - Extended Mode 1 Code in Octal Representation**

Element
bit size: 12
Octal string (3-bits per char)

**Notes:**

1. If Subitem #1 is present, the M1 bit in Subitem #1 indicates whether the Extended Mode 1 Code is from a Mode 5 reply or a Mode 1 reply. If Subitem #1 is not present, the Extended Mode 1 Code is from a Mode 1 reply.
2. For reasons of backwards compatibility the logic for the setting of the V-bit was inverted compared to other similar data items.
3. The values of the bits for V, G, L, A4, A2, A1, B2 and B1 shall be identical to the values of the corresponding bits in data item I048/055.

**MD5/TOS - Time Offset for POS and GA**

Element
bit size: 8
Unsigned quantity
LSB = $1/2^7$ s $\approx 7.8125e-3$ s
unit: "s"

**Note:** TOS shall be assumed to be zero if Subitem #6 is not present.

**MD5/XP - X Pulse Presence**

Group

Spare bits: 2

**MD5/XP/XP - X-pulse from Mode 5 PIN Reply/Report**

Element
bit size: 1
Values:

**0:** X-Pulse not present
**1:** X-pulse present

**MD5/XP/X5 - X-pulse from Mode 5 Data Reply or Report**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no authenticated Data reply or Report received
**1:** X-pulse set to one (present)

**MD5/XP/XC - X-pulse from Mode C Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode C reply
**1:** X-pulse set to one (present)

**MD5/XP/X3 - X-pulse from Mode 3/A Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 3/A reply
**1:** X-pulse set to one (present)

**MD5/XP/X2 - X-pulse from Mode 2 Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 2 reply
**1:** X-pulse set to one (present)

**MD5/XP/X1 - X-pulse from Mode 1 Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 1 reply
**1:** X-pulse set to one (present)

**Note:** Within Mode 5 replies/reports, the X-Pulse can be set for the following cases: 1. In a combined Mode 1 and Mode 2 reply/report: in this case the X5 bit and the X2 bit shall be set; 2. In a combined Mode 3 and Mode C reply/report: in this case the X5 bit and the X3 bit shall be set; 3. In a Mode 5 PIN data reply/report: in this case the X5 bit and the XP bit shall be set. The X1 bit and the XC bit are meaningless as in Mode 1 and Mode C replies/reports the X Pulse is not defined. They are kept for compatibility reasons.

**Note:** In 2011 NATO has modified the format of the National Origin information available in subitem 2 of the Mode 5 data item in this Reserved Expansion Field. The information for National Origin and Mission Code were combined into a 11-bit long field. In order to maintain backwards compatibility and to ease the use of the new layout, the original Mode 5 data item was copied and the layout of subitem #2 adapted. The new layout is reflected in the data item M5N and shall be used by equipment prepared for the new National Origin system. Equipment certified to the previous encoding shall continue to use the data item MD5 corresponding to the 5-bit National Origin / 6-bit Mission Code.

### M5N - Mode 5 Reports, New Format

definition: Mode 5 Data/Reports, Extended Mode 1 Code and X pulse following the updated NATO format for the National Origin code

Compound

**M5N/SUM - Mode 5 Summary**

Group

**M5N/SUM/M5**

Element
bit size: 1
Values:

**0:** No Mode 5 interrogation
**1:** Mode 5 interrogation

**M5N/SUM/ID**

Element
bit size: 1
Values:

**0:** No authenticated Mode 5 ID reply/report
**1:** Authenticated Mode 5 ID reply/report

**M5N/SUM/DA**

Element
bit size: 1
Values:

**0:** No authenticated Mode 5 Data reply/report
**1:** Authenticated Mode 5 Data reply/report (i.e any valid Mode 5 reply type other than ID)

**M5N/SUM/M1**

Element
bit size: 1
Values:

**0:** Mode 1 code not present or not from Mode 5 reply/report
**1:** Mode 1 code from Mode 5 reply/report

**M5N/SUM/M2**

Element
bit size: 1
Values:

**0:** Mode 2 code not present or not from Mode 5 reply/report
**1:** Mode 2 code from Mode 5 reply/report

**M5N/SUM/M3**

Element
bit size: 1
Values:

**0:** Mode 3 code not present or not from Mode 5 reply/report
**1:** Mode 3 code from Mode 5 reply/report

**M5N/SUM/MC**

Element
bit size: 1
Values:

**0:** Mode C altitude not present or not from Mode 5 reply/report
**1:** Mode C altitude from Mode 5 reply/report

Spare bits: 1

**Notes:**

4. The flags M2, M3, MC refer to the contents of data items I048/050, I048/070 and I048/090 respectively. The flag M1 refers to the contents of data item I048/055, Mode 1 Code in Octal Representation, and to the contents of the Subitem #5 (Extended Mode 1 Code in Octal Representation).
5. If an authenticated Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I048/020, Target Report Descriptor, shall be set.
6. If an authenticated Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I048/020, Target Report Descriptor, shall be set.

**M5N/PMN - PIN/ National Origin/Mission Code**

Group

Spare bits: 2

**M5N/PMN/PIN - PIN Code**

Element
bit size: 14
Raw Content

Spare bits: 4

**M5N/PMN/NOV - Validity of NO**

Element
bit size: 1
Values:

**0:** National Origin is valid
**1:** National Origin is invalid

**M5N/PMN/NO - National Origin**

Element
bit size: 11
Raw Content

**Note:** Bit 12 (NOV) is set to 1 if the value for National Origin is not known or invalid. Under certain conditions PIN is available but NO is not available. NOV then indicates that the NO field was not actively populated.

**M5N/POS - Mode 5 Reported Position**

Group

**M5N/POS/LAT - Latitude in WGS 84**

Element
bit size: 24
Signed quantity
LSB = $180/2^23$ ° ≈ $2.1457672119140625e-5$ °
unit: ”°”
>= $-90.0$
<= $90.0$

**M5N/POS/LON - Longitude in WGS 84**

Element
bit size: 24
Signed quantity
LSB = $180/2^23$ ° ≈ $2.1457672119140625e-5$ °
unit: ”°”
>= $-180.0$
<= $180.0$

**Notes:** Latitude in WGS 84 is expressed as a 24-bit two’s complement number. Range -90° ≤ latitude ≤ 90°. Sign convention: North is positive. LSB = 180/223 degrees = 2.145767*10-05 degrees
Longitude in WGS 84 is expressed as a 24-bit two’s complement number. Range -180° ≤ longitude < 180°. Sign convention: East is positive. LSB = 180/223 degrees = 2.145767*10-05 degrees
The resolution implied by the LSB is better than the resolution with which Mode 5 position reports are transmitted from aircraft transponders using currently defined formats.

**M5N/GA - Mode 5 GNSS-derived Altitude**

Group

Spare bits: 1
**M5N/GA/RES**

description: Resolution with which the GNSS-derived Altitude (GA) is reported

Element
bit size: 1
Values:

**0:** GA reported in 100 ft increments
**1:** GA reported in 25 ft increments

**M5N/GA/GA**

description: GNSS-derived Altitude of target, expressed as height above WGS 84 ellipsoid

Element
bit size: 14
Signed quantity
LSB = 25 ft ≈ 25.0 ft
unit: ”ft”
>= −1000.0

**M5N/EM1 - Extended Mode 1 Code in Octal Representation**

Group

**M5N/EM1/V**

Element
bit size: 1
Values:

**0:** Code not validated
**1:** Code validated

**M5N/EM1/G**

Element
bit size: 1
Values:

**0:** Default
**1:** Garbled code

**M5N/EM1/L**

Element
bit size: 1
Values:

**0:** Mode 1 Code derived from the reply of the transponder
**1:** Mode 1 Code not extracted during the last scan

Spare bits: 1

**M5N/EM1/EM1 - Extended Mode 1 Code in Octal Representation**

Element
bit size: 12
Octal string (3-bits per char)

**Notes:**

1. If Subitem #1 is present, the M1 bit in Subitem #1 indicates whether the Extended Mode 1 Code is from a Mode 5 reply or a Mode 1 reply. If Subitem #1 is not present, the Extended Mode 1 Code is from a Mode 1 reply.
2. For reasons of backwards compatibility the logic for the setting of the V-bit was inverted compared to other similar data items.
3. The values of the bits for V, G, L, A4, A2, A1, B2 and B1 shall be identical to the values of the corresponding bits in data item I048/055.

**M5N/TOS - Time Offset for POS and GA**

Element
bit size: 8
Unsigned quantity
LSB = $1/2^7$ s ≈ $7.8125e-3$ s
unit: ”s”

**Note:** TOS shall be assumed to be zero if Subitem #6 is not present.

**M5N/XP - X Pulse Presence**

Group

Spare bits: 2

**M5N/XP/XP - X-pulse from Mode 5 PIN Reply/Report**

Element
bit size: 1
Values:

**0:** X-Pulse not present
**1:** X-pulse present

**M5N/XP/X5 - X-pulse from Mode 5 Data Reply or Report**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no authenticated Data reply or Report received
**1:** X-pulse set to one (present)

**M5N/XP/XC - X-pulse from Mode C Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode C reply
**1:** X-pulse set to one (present)

**M5N/XP/X3 - X-pulse from Mode 3/A Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 3/A reply
**1:** X-pulse set to one (present)

**M5N/XP/X2 - X-pulse from Mode 2 Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 2 reply
**1:** X-pulse set to one (present)

**M5N/XP/X1 - X-pulse from Mode 1 Reply**

Element
bit size: 1
Values:

**0:** X-pulse set to zero or no Mode 1 reply
**1:** X-pulse set to one (present)

**Note:** Within Mode 5 replies/reports, the X-Pulse can be set for the following cases: 1. In a combined Mode 1 and Mode 2 reply/report: in this case the X5 bit and the X2 bit shall be set; 2. In a combined Mode 3 and Mode C reply/report: in this case the X5 bit and the X3 bit shall be set; 3. In a Mode 5 PIN data reply/report: in this case the X5 bit and the XP bit shall be set. The X1 bit and the XC bit are meaningless as in Mode 1 and Mode C replies/reports the X Pulse is not defined. They are kept for compatibility reasons.

**M5N/FOM - Figure of Merit**

Group

Spare bits: 3

**M5N/FOM/FOM**

description: Figure of Merit. Position Accuracy as extracted and provided by a Mode 5 transponder.

Element
bit size: 5
Raw Content

**Note:** In 2011 NATO has modified the format of the National Origin information available in subitem 2 of the Mode 5 data item in this Reserved Expansion Field. The

information for National Origin and Mission Code were combined into a 11-bit long field. In order to maintain backwards compatibility and to ease the use of the new layout, the original Mode 5 data item was copied and the layout of subitem #2 adapted. The new layout is reflected in the data item M5N and shall be used by equipment prepared for the new National Origin system. Equipment certified to the previous encoding shall continue to use the data item MD5 corresponding to the 5-bit National Origin / 6-bit Mission Code.

**M4E - Extended Mode 4 Report**

definition: Extended encoding of the Mode 4 interrogation result

Extended

Spare bits: 5

**M4E/FOEFRI - Indication Foe/Friend (Mode4)**

Element
bit size: 2
Values:

- **0:** No Mode 4 interrogation
- **1:** Possibly friendly target
- **2:** Probably friendly target
- **3:** Friendly target

*(FX) - extension bit*

**RPC - Radar Plot Characteristics**

definition: Extension to data item I048/130 for primary reports

Compound

**RPC/SCO - Score**

description: The score describes the number of raw responses used to create the plot.

Element
bit size: 8
Unsigned integer

**RPC/SRC - Signal/Clutter Ratio**

description: The Signal / Clutter Ratio describes the difference in signal strength between the signal constituting the raw plot and the signal of the clutter.

Element
bit size: 16
Unsigned quantity
LSB = $1/10$ dB $\approx 0.1$ dB
unit: ”dB”
>= $0.1$
<= $2550.0$

**RPC/RW - Range Width**

description: The Range Width defines the difference in range between the closest proximity to the radar of the raw response and the point farthest away from the radar.

Element
bit size: 16
Unsigned quantity
LSB = $1/2^8$ NM $\approx 3.90625e-3$ NM
unit: ”NM”
<= $256.0$

**RPC/AR - Ambiguous Range**

description: The Ambiguous Range describes the Pulse Repetition Interval of the radar in range.

Element
bit size: 16
Unsigned quantity
LSB = $1/2^8$ NM ≈ $3.90625e-3$ NM
unit: ”NM”
<= $256.0$

**ERR - Extended Range Report**

definition: Adaptation of data item I048/040 to extended range radars for provision of the measured range of an aircraft in local polar coordinates when the range is equal to or greater than 256NM

Element
bit size: 24
Unsigned quantity
LSB = $1/2^8$ NM ≈ $3.90625e-3$ NM
unit: ”NM”
<= $65535.0$

**Notes:**

1. For radars with an operational range beyond 256 NM data item I048/040 is insufficient. These radars may use this extension to provide the target position equal to or beyond 256 NM. In such cases, data item I048/040 shall be transmitted in addition to this extension. In this case it is recommended to set bits 32/17 in data item I048/040 to “1”.
2. The Encoding Rule for data item I048/040 still applies.
3. This item represents the measured target position of the plot, even if associated with a track, for the present antenna scan. It is expressed in polar co-ordinates in the local reference system, centred on the radar station.
4. In case of combined detection by a PSR and an SSR, then the SSR position is sent.
5. Before migrating an ASTERIX encoder to Edition 1.10 of this specification, care has to be taken that receiving decoders allow the presence of the value 256 NM in the record. Systems applying a range check may otherwise suppress the record.

**RTC - Radar Track Characteristics**

definition: Additional Track Characteristics

Compound

**RTC/PTL - Plot/Track Link**

description: Providing link between a track and its associated plot.
Group

Spare bits: 3

**RTC/PTL/SCN - Track / SCN Association**

Element
bit size: 1
Values:

**0:** Track is not associated with an SCN Plot
**1:** Track is associated with an SCN Plot

**RTC/PTL/RC - Roll Call Component**

Element
bit size: 1
Values:

**0:** Associated Plot does not contain a Roll Call component

**1:** Associated Plot contains at least a Roll Call component

**RTC/PTL/AC - All Call Component**

Element
bit size: 1
Values:

**0:** Associated Plot does not contain an All Call component

**1:** Associated Plot contains at least an All Call component

**RTC/PTL/SSR - SSR Component**

Element
bit size: 1
Values:

**0:** Associated Plot does not contain an SSR component

**1:** Associated Plot contains at least an SSR component

**RTC/PTL/PSR - PSR Component**

Element
bit size: 1
Values:

**0:** Associated Plot does not contain a PSR component

**1:** Associated Plot contains at least a PSR component

**RTC/PTL/PLOTNR**

description: Unique reference to the associated plot record

Element
bit size: 16
Raw Content

**Notes:**

1. (to bits-16/1): If SCN = 0, PLOTNR shall be set to 0.
2. (to bit-21): If SCN = 1, I048/020/SCN#VAL – if implemented - shall be set to “1”.

**RTC/ATL - ADS-B/Track Link**

description: Providing link between a track and its associated ADS-B Report.
Repetitive
Regular, 1 byte(s) REP field size.

Element
bit size: 16
Raw Content

**Note:** The presence of this information shall be communicated in Data Item I048/020 by setting I048/020/ADSB#VAL – if implemented - = 1.

**RTC/TRN - Turn State**

description: Turn State with probability with regards to track evolution hypothesis (Circular model).

Element
bit size: 8
Unsigned quantity
LSB = 1 % ≈ 1.0 %
unit: ”%”
<= 100.0

**RTC/NPP - Next Predicted Position**

description: Next predicted position for a track update at the next expected antenna rotation in reference to the current track update.
Group

**RTC/NPP/PREDRHO - Predicted Range**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ NM ≈ $7.8125e-3$ NM
unit: ”NM”

**RTC/NPP/PREDTHETA - Predicted Azimuth**

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

**RTC/NPP/EVOLRHOSTART - Predicted Closest Range**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ NM ≈ $7.8125e-3$ NM
unit: ”NM”

**RTC/NPP/EVOLRHOEND - Predicted Largest Range**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ NM ≈ $7.8125e-3$ NM
unit: ”NM”

**RTC/NPP/EVOLTHETASTART - Predicted Smallest Azimuth**

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

**RTC/NPP/EVOLTHETAEND - Predicted Largest Azimuth**

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

**RTC/NPP/NOISERHOSTART - Predicted Closest Range**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ NM ≈ $7.8125e-3$ NM
unit: ”NM”

**RTC/NPP/NOISERHOEND - Predicted Largest Range**

Element
bit size: 16

Unsigned quantity
LSB = $1/2^7$ NM ≈ $7.8125e-3$ NM
unit: ”NM”

**RTC/NPP/NOISETHETASTART - Predicted Smallest Azimuth**

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

**RTC/NPP/NOISETHETAEND - Predicted Largest Azimuth**

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

**RTC/NPP/PREDTIME - Predicted Detection Time**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ s ≈ $7.8125e-3$ s
unit: ”s”

**Notes:**

1. When the area crosses North, THETASTART is larger than THETAEND.
2. Next detection = Time of Day of current track record + PREDTIME.

**RTC/DLK - Data Link Characteristics**

description: Active message list for the aircraft for the current scan.
Repetitive
Regular, 1 byte(s) REP field size.
Group

**RTC/DLK/TYPE**

description: Type of Message Protocol
Element
bit size: 4
Values:

**0:** Surveillance Mode A (alert bit or periodic)
**1:** Comm-A
**2:** Ground Initiated Comm-B
**3:** Air Initiated Comm-B
**4:** Broadcast Comm-B
**5:** Comm-C
**6:** Comm-D
**7:** Reserved for future use
**8:** Reserved for future use
**9:** Reserved for future use
**10:** Reserved for future use
**11:** Reserved for future use
**12:** Reserved for future use
**13:** Reserved for future use
**14:** Reserved for future use
**15:** Reserved for future use

**RTC/DLK/ORIGIN**

description: Frame Detection
Element
bit size: 2
Values:

**0:** From previous scan
**1:** New in current scan
**2:** Requested in the beam by transponder
**3:** Invalid ASTERIX value

**RTC/DLK/STATE**

description: Frame state at aircraft release

Element
bit size: 2
Values:

**0:** In progress
**1:** Completed
**2:** Cancelled
**3:** Invalid ASTERIX value

**RTC/LCK - Lockout Characteristics**

description: Lockout State and remaining Lockout Time
Group

**RTC/LCK/LS - Lockout State**

Element
bit size: 1
Values:

**0:** Target not locked out by this radar
**1:** Target locked out by this radar

**RTC/LCK/LOCTIM - Lockout Time**

Element
bit size: 15
Unsigned quantity
LSB = 1 ms ≈ 1.0 ms
unit: ”ms”

**RTC/TC - Transition Code**

description: Indication and Counter of Transition Codes for Modes 1, 2, and 3
Group

Spare bits: 7

**RTC/TC/TCOUNT1**

description: Number of scans with transient Mode 1 Code

Element
bit size: 4
Unsigned integer

**RTC/TC/TCODE1**

description: Transient Mode 1 Code

Element
bit size: 5
Raw Content

**RTC/TC/TCOUNT2**

description: Number of scans with transient Mode 2 Code

Element
bit size: 4
Unsigned integer

**RTC/TC/TCODE2**

description: Transient Mode 2 Code

Element
bit size: 12
Octal string (3-bits per char)

**RTC/TC/TCOUNT3**

description: Number of scans with transient Mode 3 Code
Element
bit size: 4
Unsigned integer

**RTC/TC/TCODE3**

description: Transient Mode 3 Code
Element
bit size: 12
Octal string (3-bits per char)

**Notes:**

1. This item indicates a difference in the value for TCODEX between the code in the track file and the code from the latest plot updating the track.
2. If TCOUNTX is set to 0 then TCODEX is meaningless and all bits shall be set to 0.
3. The meaning of the individual bits in TCODEX is described in ICAO Annex 10 Volume 4 Chapter 3.1.1.6.2.

**RTC/TLC - Track Life Cycle**

description: Acquisition Status of the Track and Track Life Cycle Counters
Group

**RTC/TLC/ACQI**

description: Acquisition Status Indicator
Element
bit size: 2
Values:
**0:** Tentative Track with One Plot
**1:** Tentative Track with at least Two Plots
**2:** Pre-Confirmed Track
**3:** Confirmed Track

**RTC/TLC/TRKUPDCTR**

description: Track Update Counter
Element
bit size: 14
Unsigned integer

**RTC/TLC/LASTTRKUPD**

description: Time since last Track Update
Element
bit size: 16
Unsigned quantity
LSB = 1 ms ≈ 1.0 ms
unit: ”ms”

**Notes:**

1. When Subitem #8 is included, each element shall be properly populated.
2. The setting of bits 32/31 is implementation dependent and shall be described in the ICD of the system generating the ASTERIX record.
3. The TRKUPDCTR is initiated with a value of 1 and it is incremented by 1 each time a track is updated.
4. The LASTTRKUPD is set to 0 each time a track is updated.

**RTC/ASI - Adjacent Sensor Information**

description: Adjacent Sensor information (received via SCN) for the respective Mode S address
Repetitive
Regular, 1 byte(s) REP field size.
Group

**RTC/ASI/SACADJS - SAC of the Adjacent Sensor**

Element
bit size: 8
Raw Content

**RTC/ASI/SICADJS - SIC of the Adjacent Sensor**

Element
bit size: 8
Raw Content

**RTC/ASI/TIMEOFDAYSCN - Absolute Timestamp in UTC Provided by the SCN**

Element
bit size: 16
Unsigned quantity
LSB = $1/2^7$ s ≈ $7.8125e-3$ s
unit: "s"

**RTC/ASI/DATAUSE - Use of Adjacent Sensor Data**

Element
bit size: 7
Values:

- **0:** Data used by Tracker
- **1:** Data not used by Tracker
- **2:** 2-127: Reserved for future use

**RTC/ASI/DRNA - DRN Availability**

Element
bit size: 1
Values:

- **0:** DRN not available
- **1:** DRN available

**RTC/ASI/DRN**

description: Duplicate Address Reference Number uniquely identifying the aircraft in case of a duplicate Mode S Address

Element
bit size: 16
Raw Content

**RTC/TES - Track Extrapolation Source**

description: Source for the extrapolation of the track information

Element
bit size: 8
Values:

- **0:** Radar tracker calculation
- **1:** Integrated ADS-B
- **2:** External ADS-B
- **3:** SCN

**RTC/IR - Identity Requested**

description: Information whether during latest scan the Mode 3/A Code was requested
Group

**RTC/IR/IR**

description: Identity Requested during latest scan

Element
bit size: 1
Values:

- **0:** Identity not requested
- **1:** Identity requested

**RTC/IR/M3A - Age of Mode 3/A Code (I048/070)**

Element
bit size: 7
Unsigned quantity
LSB = 1 s ≈ 1.0 s
unit: ”s”

## CPC - Common and Plot Characteristics

definition: Plot Characteristics and Common Characteristics for Plots and Tracks
Compound

**CPC/PNB - Plot Number**

description: Unique reference to a Plot Record

Element
bit size: 16
Raw Content

**CPC/RPL - Replies/Plot Link**

description: Link between a Plot and its Replies
Repetitive
Regular, 1 byte(s) REP field size.
Group

**CPC/RPL/TYPE - Reply Type**

Element
bit size: 8
Values:

- **0:** PSR Echo
- **1:** SSR Reply
- **2:** All Call Reply
- **3:** Roll Call Reply

**CPC/RPL/REPLYNBR**

description: Unique reference to a plot record

Element
bit size: 16
Raw Content

**CPC/SNB - Scan Number**

description: Scan Number

Element
bit size: 8
Unsigned integer

**Note:** The Scan Number ranges from 1 to 127 and is incremented when the radar passes North. Once SCANNBR reached 127 it will restarted at 1 with the next scan.

**CPC/DATE - Common and Plot Characteristics Date**

description: Current Date in the form YYYYMMDD
Group

**CPC/DATE/Y1**

description: First digit of year

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**CPC/DATE/Y2**

description: Second digit of year

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**CPC/DATE/Y3**

description: Third digit of year

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**CPC/DATE/Y4**

description: Fourth digit of year

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**CPC/DATE/M1**

description: First digit of month

Element
bit size: 4
Unsigned integer
>= 0.0
<= 1.0

**CPC/DATE/M2**

description: Second digit of month

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**CPC/DATE/D1**

description: First digit of day

Element
bit size: 4
Unsigned integer
>= 0.0
<= 3.0

**CPC/DATE/D2**

description: Second digit of day

Element
bit size: 4
Unsigned integer
>= 0.0
<= 10.0

**Note:** The day is incremented at midnight UTC.

### GEN48 - Generic Category 048 Data

definition: Placeholder for the addition of information to Category 048 even if all bits of the Item Indicator are allocated

Compound

**GEN48/ALTM2 - Alternative Mode 2 Code**

description: Mode 2 Information in octal representation received via an alternative technology as compared to Data Item I048/050.
Group

**GEN48/ALTM2/V**

Element
bit size: 1
Values:

**0:** Code validated
**1:** Code not validated

**GEN48/ALTM2/G**

Element
bit size: 1
Values:

**0:** Default
**1:** Garbled code

**GEN48/ALTM2/L**

Element
bit size: 1
Values:

**0:** Mode-2 code as derived from reply of the transponder
**1:** Smoothed Mode-2 as provided by a local tracker

Spare bits: 1

**GEN48/ALTM2/ALTM2 - Mode-2 Code in Octal Representation**

Element
bit size: 12
Octal string (3-bits per char)

**Note:** For radar systems interrogating with various technologies (such as military radars interrogating in Mode S and Mode 5), this item provides the possibility to transmit an alternative Mode-2 value. The population of this item is implementation dependent and shall be described in the System ICD.

**GEN48/ALTM3 - Alternative Mode 3/A**

description: Mode-3/A Code as received from the transponder via an alternative technology as compared to Data Item I048/070.
Group

**GEN48/ALTM3/V**

Element
bit size: 1
Values:

**0:** Code validated
**1:** Code not validated

**GEN48/ALTM3/G**

Element
bit size: 1
Values:

**0:** Default
**1:** Garbled code

**GEN48/ALTM3/L**

Element
bit size: 1
Values:

**0:** Mode-3/A code as derived from the reply of the transponder

**1:** Smoothed Mode-3/A code as provided by a local tracker

Spare bits: 1

**GEN48/ALTM3/ALTM3 - Mode-3/A Code in Octal Representation**

Element
bit size: 12
Octal string (3-bits per char)

**Note:** For radar systems interrogating with various technologies (such as military radars interrogating in Mode S and Mode 5), this item provides the possibility to transmit an alternative Mode-3/A value. The population of this item is implementation dependent and shall be described in the System ICD.

**GEN48/ALTFL - Alternative Flight Level**

description: Flight Level derived from an alternative technology as compared to Data Item I048/090, converted into binary representation.

Group

**GEN48/ALTFL/V**

Element
bit size: 1
Values:

**0:** Code validated
**1:** Code not validated

**GEN48/ALTFL/G**

Element
bit size: 1
Values:

**0:** Default
**1:** Garbled code

**GEN48/ALTFL/ALTFL - Flight Level in Two's Complement Form**

Element
bit size: 14
Signed quantity
LSB = $1/2^2$ ALTFL $\approx 0.25$ ALTFL
unit: ”ALTFL”

Notes:

1. When Mode C code is present but not decodable, the “Undecodable Mode C code / Mode S altitude code” Warning/Error should be sent in I048/030.
2. When local tracking is applied and the received Mode C code corresponds to an abnormal value (the variation with the previous plot is estimated too important by the tracker), the “Mode C code / Mode S altitude code abnormal value compared to the track“ Warning/Error should be sent in I048/030.
3. The value shall be within the range described by ICAO Annex 10.
4. For radar systems interrogating with various technologies (such as military radars interrogating in Mode S and Mode 5), this item provides the possibility to transmit an alternative Flight Level value. The population of this item is implementation dependent and shall be described in the System ICD.

**GEN48/RCSDB - Radar Cross Section**

description: Radar Cross Section of the Target expressed in dBm².
Group

Spare bits: 2
**GEN48/RCSDB/RCSDB**

description: Radar Cross Section in Two's Complement.

Element
bit size: 14
Signed quantity
LSB = $1/100$ dBm² ≈ $1.0e-2$ dBm²
unit: "dBm²"
>= $-60.0$
<= $30.0$

**Note:**

- To populate this Item, the antenna gain in azimuth an elevation must be known.

**GEN48/RCSM - Radar Cross Section**

description: Radar Cross Section of the Target expressed in m².
Group

Spare bits: 2
**GEN48/RCSM/RCSM**

description: Radar Cross Section.

Element
bit size: 30
Unsigned quantity
LSB = $1/10^6$ m² ≈ $1.0e-6$ m²
unit: "m²"
>= $1.0e-6$
<= $1000.0$

**Note:**

- To populate this Item, the antenna gain in azimuth an elevation must be known.